a feed-forward control function,

wherein a demand signal is simultaneously applied to respective inputs of the feedback and feed-forward control functions, and respective outputs of the feedback and feed-forward control functions are summed together to generate the plant input, the feed-forward control function having a first component which is a function of a model of the linear component of the plant characteristic, and a second component which is an adaptive function to compensate for the non-linear component of the plant characteristic, the adaptive function being substantially modeled on the non-linear component of the plant characteristic and having adaptive laws which vary parameters of the adaptive function with time such that the adaptive function approaches the non-linear component of the plant characteristic, and

wherein the plant is a permanent magnet linear motor (PMLM).

2. (Amended) The control system of claim **1** wherein the non-linear component of the plant characteristic is of the form:

$$u_{ripple} = A(x)\sin(\omega x + \emptyset) = A_1(x)\sin(\omega x) + A_2(x)\cos(\omega x),$$

where x is the plant variable,

and where the adaptive function has the form:

$$u_{AFC} = a_1(x(t))\sin(\omega x) + a_2(x(t))\cos(\omega x),$$

where

$$a_1(x(t)) = -ge\sin(\omega x),$$

$$a_2(x(t)) = -ge\sin(\omega x),$$

e is an error signal given by:

$$e = (x_d - x),$$

a3 cancel'd

g is an adaptation gain and is greater than 0, x_d is the desired function of the plant variable and ω is related to 1/period of the non-linear component of the plant characteristic, such that the adaptive feed-forward control function continuously adjusts the parameters a_1 & a_2 in response to the error signal *e*.

3. (Amended) The system of claim **2**, wherein the plant variable x represents an instantaneous position of a translator of the linear motor, the desired function of the plant variable x_d represents the desired trajectory of the translator and the PMLM has a magnetic structure having a pole pitch x_p, such that $\omega = 2\pi / x_p$.

a4

8. (Amended) The system of claim **1**, wherein the feedback control function is a Proportional/Integral/Derivative (PID) controller.